

Lightweight, Radiation Resistant, Low Tg, Thoriaeus Rubber Inflatable Space Habitats, Phase I

Completed Technology Project (2011 - 2012)



Project Introduction

NanoSonic's Shape Memory Metal Rubber

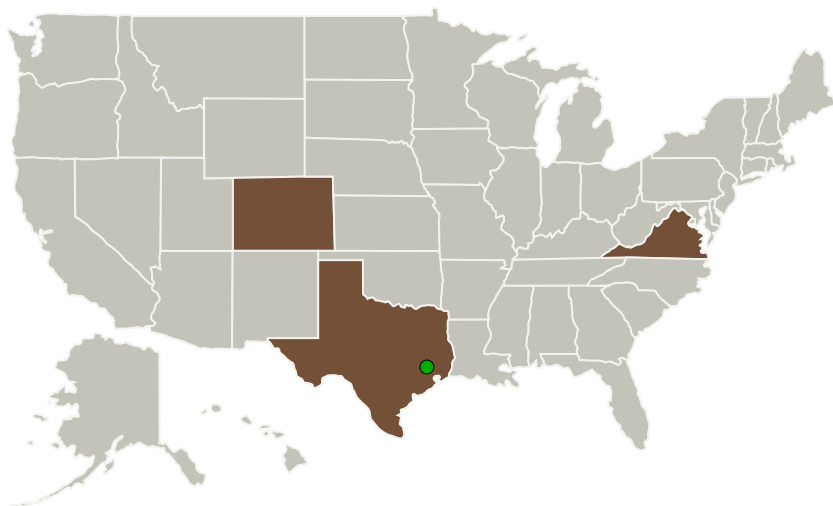
TM

(SM-MR) exhibits reconfigurable and recoverable changes in structural and RF properties as it can be mechanically and repeatedly inflated without loss of EMI shielding (-88dB). In support of NASA's goals for a robust space exploration program, it is anticipated that NanoSonic's lightweight low permeable bladders shall also exhibit long term radiation resistance upon morphing; a property that few, if any, inflatable materials offer. Typical highly filled or metal evaporated nanocomposites crack upon flexing. Conformal and compliant SM-MR is based on self-assembled high-z, dense, nanoparticles covalently bound to ultra-low glass transition temperature (as low as -145°C, 128 Kelvin) elastomeric or shape memory polymers. NanoSonic and our STTR partner, Colorado State University, have demonstrated that SM-MR is up to 50% lighter in weight and provides greater gamma ray attenuation relative to commercial shielding materials, without emitting harmful secondary radiation under a 137Cs source. During Phase I, low temperature flexibility, and radiation/micrometeorite (lunar dust) resistance would be verified under simulated Galactic Cosmic Radiation (GCR) conditions, using gamma radiation sources and an electron accelerator with uniform beams up to 20 MeV. TRL9 shall be reached with our space systems partner upon infusion of Thoriaeus Rubber

TM

onto NASA habitats.

Primary U.S. Work Locations and Key Partners



Lightweight, Radiation Resistant,
Low Tg, Thoriaeus Rubber
Inflatable Space Habitats, Phase
I

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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Colorado State University-Fort Collins	Supporting Organization	Academia	Fort Collins, Colorado
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Colorado	Texas
Virginia	

Project Transitions

▶ **February 2011:** Project Start

✓ **February 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139159>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

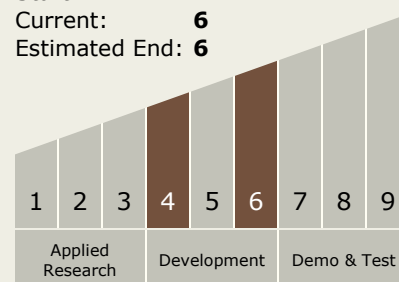
Carlos Torrez

Principal Investigator:

Jennifer Lalli

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.2 Structures
 - └ TX12.2.5 Innovative, Multifunctional Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System